

*F.* Acute or acuminate.

*Hypnum.*

*EE.* Entire.

*F.* Acute.

*Calliergon Schreberi.*

*CC.* CAPSULE OVOID, ERECT OR INCLINED.

*D.* Costate.

*E.* Serrate.

*F.* Acuminate.

*Cirriphyllum Boscii.*

*Brachythecium.*

(To be continued)

## NOTES ON PHILIPPINE VEGETATION: THE CASUARINA ASSOCIATION

BY FRANK C. GATES

One of the most striking impressions one receives in different countries is a similarity of the appearance of vegetation, *en masse*, produced by entirely different plants. Even a second general look at the vegetation as a whole may not disclose the differences which, however, a closer observation reveals.

The vegetation of the sandy river-bottom flats in Central



FIG. 1. A general view of a grove of *Casuarina equisetifolia*. Villar, Zambales Province, December 24, 1914.

Zambales Province, Philippine Islands, furnishes an excellent example. As is shown in the figures, the resemblance of the

forests of *Casuarina equisetifolia* Forst. (Casuarinaceae) to a coniferous forest is considerable. It is summed up in the common name, jointed pine, which many apply to *Casuarina*. The jointed branches with their very much reduced leaves closely resemble a spray of white pine (*Pinus strobus*), although the general appearance of the bark and the mode of branching is less similar. The jointed branches ("needles") on the ground and the grassy, park-like appearance of the grove furthers the general resemblance.

The habitat here occupied by *Casuarina* is the low sandy flood plain flats along the rivers. The soil is a coarse, light-colored sand, deficient in food materials. Upper flats—former



FIG. 2. An average grove of *Casuarina*, showing the openness of vegetation at the ground. Villar, Zambales Province, December 24, 1914.

flood plains, but now high above the river and fire-swept each year—are not occupied by *Casuarina*.

The climate is severe. Six and one half months are hot and very dry, while, during three of the remaining five and one half months, rain is nearly continuous. The average rainfall for the year is 3952 mm.\* (156 inches) of which 3,771 mm. (149 inches) or 95.5 per cent. falls from May through October, during the period of southwest winds. 3,595 mm. (142 inches) or 91 per

\* Records furnished through the courtesy of the Philippine Weather Bureau.

cent. falls from May through September. In the rainy season the excess of rain over the needs of the vegetation is considerable. During the northeast monsoon, which blows the rest of the year, precipitation is very deficient and the vegetation withers. The following table summarizes the temperature conditions by months:

	Highest	Lowest	Year
	° C.	° C.	° C.
Absolute maximum.....	37.8 April	32.5 August	37.8
Average maximum.....	33.1 April	29.9 August	31.5
Mean.....	28.0 May	24.9 January	26.5
Average minimum.....	23.2 June	19.0 January	21.5
Absolute minimum.....	21.7 August	13.9 January	13.9

The structure of the association is very simple, as *Casuarina* is normally the only tree present on the flats. Although the needle-like branches are very slender, in a normal grove the aggregate shade cast is very great. Very few herbaceous plants—largely low grasses, as *Eragrostis spartanoides*, *Eleusine indica*,



FIG. 3. An opening in a grove of *Casuarina*, vegetated with the grasses, *Saccharum spontaneum* and *Miscanthus sinensis*. Villar, Zambales Province, December 24, 1914.

*Panicum patens*, and *Oplismenus compositus*, and "weeds," as *Ageratum conyzoides*, *Amaranthus spinosus*, *Aneilema vitiense*, *Anisomeles indica*, *Cyperus difformis*, *Desmodium laxiflorum*,

*Elephantopus spicatus*, *Emilia sonchifolia*, *Hyptis capitata*, *Hyptis spicigera*, *Sida acuta*, *Triumfetta* sp., and *Waltheria americana* grow on the ground. A very few shrubby plants—*Flemingia cumingiana*, *Cassia alata*, *Ehretia polyantha*, *Grumilea luconiensis*, *Helicteres hirsuta*, *Melastoma polyanthum*, *Hominoia riparia*



FIG. 4. *Loranthus* sp., hemiparasitic on *Casuarina equisetifolia*. Pombato, Zambales Province, December 21, 1914.

(only at the edge of the streams), and *Acacia confusa*—and vines—*Abrus precatorius*, *Deeringia baccata*, *Piper interruptum*, *Quisqualis indica*, and *Streptocaulon Baumii*—may be present. A hemiparasite, *Loranthus* sp. often forms dense clumps in the crowns of *Casuarina*, as shown in Fig. 4. The dark green color of *Loranthus* is in direct contrast to the light grayish green of *Casuarina*.

Openings made in *Casuarina* groves generally become covered with the tall grasses, *Saccharum spontaneum*, *Rottboellia ophiur-*



*oides*, and *Miscanthus sinensis*. (See Fig. 3.) The growth of grass is gradually replaced by *Casuarina*, provided the area is sufficiently free from fire. A stand of young *Casuarina* is very dense and in appearance greatly resembles a stand of young white pine.

CARTHAGE COLLEGE,  
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## PROCEEDINGS OF THE CLUB

JANUARY 11, 1916

The annual meeting was held January 11, 1916, at the American Museum of Natural History at 8:15 P.M., President Harper presiding. Twenty-six persons were present.

The minutes of meetings held November 24 and December 14, 1915, were read and approved.

The following persons were nominated for membership: Mr. C. M. Shipman, Rossville, N. Y.; Dr. A. F. Blakeslee, Cold Spring Harbor, N. Y.; Dr. Walter Mendelson, 159 West 74th St., New York; Miss Wanda M. Kirkbride, 1230 Amsterdam Ave., New York; Miss Isabel C. Darrow, 503 W. 121st St., New York; Mr. E. S. Schultz, Columbia University; Miss Edna Adams, Hartsdale, N. Y.; Mr. Edwin L. Keeler, White Plains, R. F. D. No. 1, N. Y.

Mr. Percy Wilson, chairman of the field committee, read the following report:

"Thirty-one field meetings were scheduled by the field committee between Saturday, April 3, and Sunday, October 17. In all there were 488 persons present, an average attendance of 16.

"As some members were unable to attend the Saturday meetings, the field committee was authorized by the club to arrange an occasional field meeting on Sunday. At the eight Sunday meetings held, 123 persons were present, an average attendance of 15.

"The largest attendance of any one of the field meetings, excluding the special field meetings held during the Twentieth Anniversary Celebration of the New York Botanical Garden,